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Ireland, George H.

The preventable causes of disease, injury...

Concord, N.H.

1886

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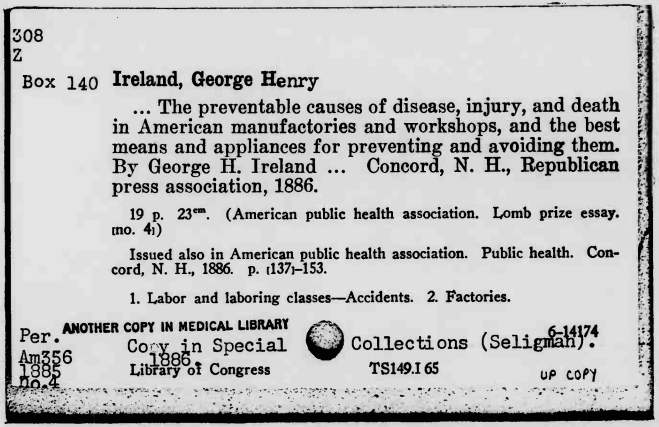

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The Preventable Causes of Disease, Injury, and Death in American Manufactories and Workshops, and the best Means and Appliances for Preventing and Avoiding Them.

American Public Health Association

LOMB PRIZE ESSAY

THE PREVENTABLE CAUSES OF DISEASE, INJURY, AND DEATH IN AMERICAN MANUFACTORIES AND WORKSHOPS, AND THE BEST MEANS AND APPLIANCES FOR PREVENTING AND AVOIDING THEM

By GEORGE H. IRELAND
Springfield, Mass.

PRESTON

Concord, N. H.
Republican Press Association, 22 North Main Street
1886

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Nov 2, 1922 net

INTRODUCTION.

As the result of prizes offered by Mr. Henry Lomb, of Rochester. N. Y., through the American Public Health Association, the following awards were made at the last meeting of the association:

I. Healthy Homes and Foods for the Working Classes. By Victor C. Vaughan, M. D., Ph. D., Professor in University of Michigan. Prize, . . $200

II. The Sanitary Conditions and Necessities of School-Houses and School-Life. By D. F. Lincoln, M. D., Boston, Mass. Prize, . . . $200

III. Disinfection and Individual Prophylaxis against Infectious Diseases. By George M. Sternberg, M. D., Major and Surgeon U. S. Army. Prize, ... $500

IV. The Preventable Causes of Disease, Injury, and Death in American Manufactories and Workshops, and the Best Means and Appliances for Preventing and Avoiding them. By George H. Ireland, Springfield, Mass. Prize, ... $200

That these essays may be placed in the hands of every family in the country is the earnest desire of the association, as well as the heartfelt wish of the public-spirited and philanthropic citizen whose unpretentious generosity and unselfish devotion to the interests of humanity have given us these essays, but the financial inability of the association renders it impossible to distribute them gratuitously;—therefore a price covering the cost has been placed upon these publications. It is to be hoped, however, that government departments, state and local boards of health, sanitary and benevolent associations, etc., will either publish these essays, or purchase editions at cost of the association, for distribution among the people.

Although a copyright has been placed upon these essays for legitimate protection, permission to publish, under certain conditions, can be obtained by addressing the secretary.

The Preventable Causes of Disease, Injury, and Death in American Manufactories and Workshops, and the Best Means and Appliances for Preventing and Avoiding them.

COMMITTEE OF AWARD.

Dr. E. M. HUNT, Secretary State Board of Health, Trenton, N. J.

Dr. A. N. BELL. Editor *Sanitarian*, New York City.

Major GEORGE M STERNBERG, Surgeon U. S. A., Baltimore, Md.

Major JOHN S. BILLINGS, LL. D., Surgeon U. S. A., Washington, D. C.

Mr. W. P. DUNWOODY, Secretary National Board of Health, Washington, D. C.

THE PREVENTABLE CAUSES OF DISEASE, INJURY, AND DEATH IN AMERICAN MANUFACTORIES AND WORKSHOPS, AND THE BEST MEANS AND APPLIANCES FOR PREVENTING AND AVOIDING THEM.

We are aware that the home life of the average American mechanic is not what it should be. In considering our subject, we must assume that he comes from a clean house, well ventilated; that he has a pure water-supply; that he brings a well nourished body; that his clothes are clean, and duly cared for;—in fact, his wife's work "should praise her in the gates."

The location of the factory is an important subject for the workman. In the city he is exposed to lung disease from a smoky atmosphere and impure air, bad eyes from poor light during the day-time, great danger from fire owing to the buildings' being huddled together, and also from the combustible nature of the surroundings. The suburban factory presents disease in the shape of malaria and pulmonary troubles, owing to the fog that rises from the undrained land, and from fevers from the bad or no sewer connection.

Unfortunately the builders of factories have not that latitude of choice open to builders of private residences. The manufacturer has many limitations, such as water-power, and proximity to railroads and other factories. Some, of strict necessity, must be carried on in the midst of thickly settled cities. Manufacturers are, however, each year loosening the fetters that seemingly have bound them, and are exercising more thoughtful care in the selection of building sites. They find it profitable to their pockets, as well as contributory to the health of their operatives, to erect their buildings in moderate sized towns, or in the suburbs, rather than in the heart of the great cities themselves.

The building should be placed upon well drained land, and every precaution should be taken against any possible trouble from surface or overflow water. These remarks apply also to the adjoining lands, as land that fluctuates from overflow to dry soil is a frequent cause of malaria.

The building should be of brick, and, if possible, only two stories high. (A woollen manufacturer, who had the experience of several fires in his factory, remarked in our presence "that were he to rebuild, he would only build two stories high, as then, in case of fire, the hands would feel certain of their safety, and make a stubborn fight to subdue the flames.") The floor timbers should rest on ledges built in the walls. The flooring should fit closely, affording no hiding-places for rats. Where noisy occupations are to be carried on, the floors are to be "deafened." Each story

INTENTIONAL SECOND EXPOSURE

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is to be high enough to permit of good ventilation without the draft striking on the heads of the workmen; the roof to be of metal or slate; stone coping to be used on chimneys and all walls extending above the roof: this prevents loose bricks from falling. The cornices should be of sheet metal, when stone, brick, or terra cotta is not used; columns to be of hard wood or brick, as they will not warp if badly heated; chimneys to rest upon their own foundations, starting from the ground; the walls to be whitewashed directly upon the bricks. If plastering is required, use metallic lathing. The stairs, of easy pitch, are located at each end of the building. In long buildings other flights are to be added, so that no person will be obliged to go over eighty feet to reach a stairway; the stairs to be of iron, excepting the treads and risers, which may be of wood. Where women are not employed, omit the risers; each flight to reach the story above by a direct flight, no turns to be permitted; the top of each flight to be cased in, and a door provided which is to be closed each night, and after the exit of the operatives in case of fire. This door is to be of plank completely covered with tin, the joints of which are turned over. The hinges to the door are to be fastened by bolts passing clear through the door. This style of door is the proper one for inside purposes where one section of the building is divided from the others. This door will stand where the ordinary iron door would be curled up and drawn out of position by the heat. A scuttle fastened only by a hasp is to be placed in the roof over each stairway. This scuttle is reached by a flight of steps always in position. Elevators and elevator shafts are the causes of many accidents. At the best they are dangerous things, and need to be carefully guarded. The shaft forms a direct means of communication for the flames from the basement upwards; it is ever ready for the reception of any thoughtless person. The moving cage or platform crushes and maims, and the parted rope sends its precious load to the bottom of the elevator well, a mangled mass of humanity. The elevator should have safety self-locking attachments (to operate in case of a broken suspension rope), self-closing hatchways, and guards at each landing. One person should be designated to run each elevator, and he should be held strictly responsible for its proper use. Thus, detailing one person for this duty is entirely practicable, even when the elevator work is not enough to occupy his time. By a system of gong signals, he can be called from his other work to run the elevator when required. A good sized gong-bell is located in the elevator well, and strokes call as follows: One, basement; two, second floor; three, third floor; four, fourth floor; a clanging of several strokes, an emergency call. We have seen this plan most satisfactorily carried out for several years. If self-closing hatchways are not adopted, a sign marked DANGER should be suspended by cords or chains about five feet from the bottom of the elevator: this gives timely warning to those below of the descent of the elevator. Where there are projecting cross timbers in the elevator well, their corners should be rounded, in order that nothing may be caught under them. All elevators should be provided with automatic shifting

devices, to operate in case the carriage, from any cause, is left running. Ropes and chain falls should have a shifting lever attached to the beam, to be operated by a projection just above the hook. This runs the driving belt upon a loose pulley in case the winding drum is permitted to go too far. Proprietors should insist that all elevator operators, and all who ride upon *freight* elevators, maintain the standing posture, as then they are in position to use all their faculties in case of accident. It should, if possible, be a rule, upon all freight elevators, that only the operator ride. Many accidents are the direct result of "fooling" upon the slow freight elevators, where all are allowed to ride. In a factory with which we are acquainted, they have a very slow freight elevator, taking some two minutes to cover five stories. One warm day, the operator, having to go empty from the basement to the top store room, laid down upon the elevator platform. His head by some means came in contact with a timber: he would have been killed had not his cries quickly attracted the attention of one of the foremen, who stopped the elevator. As it was, his scalp hung over his face, being held only by a hinge at the forehead. Had he been standing upright, the accident could not have happened.

The annual loss of life in attempting to escape from burning factories is appalling, and the subject of fire-escapes demands the most serious consideration. Fire-escapes are of many forms. The best ones for general use, and the only kind that can be relied upon where women are employed, is the zig-zag iron stair system of ladders with *flat* treads, the whole to be of iron firmly secured to the outside of the building, and extending to the roof. Women are extremely sensitive about making any seeming exposure of their limbs;—this fact, coupled with the confusion incident to fires, has, in the opinion of experienced persons, rendered the ordinary perpendicular ladder next to useless. With the flat treads the ladders are converted, practically, into steps; the inclination is easy, and an uninjured woman or child may descend in perfect safety, and without fear. This style of fire-escape enables a sound person to assist or bring down an injured or unconscious one.

In locating the ladders, select a side of the building that may be safely covered by the hosemen standing on the ground. Do not bring the ladders near the windows of rooms containing extra inflammable material, as by so doing the exit may be cut off in case of fire. For high factories, where men alone are employed, a good supplementary escape is one of the endless chain pattern, the rate of descent being graduated and controlled by an escapement or friction governor. These escapes permit a continuous line of persons to escape, as several may be upon the descending chain at a time. This style of fire-escape presupposes a strong pair of uninjured arms and hands, and full possession of the mental faculties. Another pattern of escape is where a belt encircles the body, and has a frictional device through which the rope plays, one end of which is attached to the window frame. We have seen a man descend one hundred feet by this means. This style of escape can have only a partial approval.

The simplest of all escapes is a rope long enough to reach the ground, and attached to the inside of each window sill,—the rope, in loose coils, hanging upon a hook or pin, ready to be thrown out in case of danger. This simple rope escape is good for many purpospe, but cannot be regarded as a safe escape, as an injured person could not descend.

Where there is danger from sudden explosions or fire, and the building is not over three stories high, the "sliding poles," such as are common in the fire department houses, may be used. They afford a quick means of reaching the ground with comparative safety. Connected with the factory office there should be a system of electric bells and speaking tubes. In our factory they enter the telephone room at the office. At first we had several tubes, but we have found one general tube to be more satisfactory. At the office end, clustered around the mouth of the speaking tube, are the push-buttons for the electric bells calling the foremen. The foremen, in turn, have a button calling the main office; also one for each of the other foremen. By stepping to the tube and operating the buttons, one can speak with any or all of the foremen. The advantages of this system, in case of fire or other emergency, are apparent without further comment.

The escaping gas and odors from the water-closets are a fruitful cause of disease. The water-closets should all have a good "wash," and be trapped under the seat; and another trap should be added to the pipe as it nears the sewer. The closets of ordinary construction for the women should open from a commodious room, which is to be used as a dressing room. The closet for the men should be provided with a lifting sub-cover, thus adapting it for either a water-closet or urinal. This suggestion may be objected to by some, but observation has convinced us that the combined affair is less offensive than the separate system. For if the pans have the ventilating tubes connecting with the ventilating shafts, as is now common in all good plumbing, the constant wash of the pan will prevent all objectionable odors. The seats, pans, and pipes are to rest upon iron supports. The seats are to be of hard wood, well filled; no wood-work at the front. The floor should slope gently towards the front, and be covered with zinc nailed off with round-headed zinc nails, into squares of two or three inches on a side. This arrangement permits the free use of the mop in cleaning, and suggests a clean place with but little trouble. Many prefer the automatic operating valves, but we prefer the common method of handle and chain, as then any required amount of water may be used. If urinals are used, keep a piece of carbolic soap in each, and flush them often. All sinks and wash-bowls should be trapped. Have all the pipes in sight, and accessible. Where chemicals are poured down the sinks, use cesspools covers. These are circular pieces of wood covered on the under side with lead and rubber, and having an earthen knob on top. Ventilation should be such that a change of air is effected without drafts upon the head of any person. This may be accomplished by placing the top openings, whether into air shafts or to the outside, well up, and by keeping the inlet openings well down. Some

years ago the writer served as a junior member upon a hall committee to overlook the construction of a hall devoted to social meetings. We had all suffered in the old hall from bad air and drafts of air, although the building was supposed to have an elaborate ventilating system. In our new hall we brought the hot air register to the centre of the hall. In the wall of the building was placed a register connecting with an air chute, which also opened about the centre of the hall. Half round windows, opening downward, were placed near the ceiling. By manipulating the openings according to circumstances, a comfortable, well ventilated hall was secured at any season of the year. A bald-headed person could sit under any of the open windows in this hall, and not take cold. We believe that the drafts from the ordinary windows cause much sickness, and that the time will come when our advanced builders will imitate the best car builders, and have most of the windows tight, depending upon special appliances for ventilation. In all cases see that the new air is *pure air*. Drafts of air cause much trouble in every factory of which we have intimate knowledge. Many of these cases may be easily overcome. Probably persons do not differ as widely upon other physical conditions as upon exposure to currents of air. One man may work unaffected in a strong draft, to which his seemingly more robust shopmate would take exceptions. In those portions of the country where lung troubles and catarrh are common, great care is required. The sensitive workman should be permitted, so far as possible, to select his location. Paper caps, having two ventilating holes, are useful in many cases.

An important contributor to health is the sunlight. The difference between a well and ill lighted factory may be practically illustrated in every large city where houses, that once were healthy homes, are now sickly ones,—the cause being directly traced to the shutting off of the sun's light by high buildings being erected near them. For fine work, where the eyes are constantly used, a north light is best, the workman sitting so he receives the light directly in front or at the left hand. This will not shade the work while using the right hand. An opposite wall is improved by giving it a coat of whitewash; this also gives a good background against which to sight work while testing it. An awning to each window, although expensive, is the best summer protection we have seen. The portions of a building most often neglected as to light are the hallways and stairways, and this neglect has produced many accidents.

"Double windows" are a protection in winter for exposed locations. When used, one light should be hinged for ventilating purposes.

We think the subject of lightning-rods requires no further consideration than that they be good ones, and put up in accordance with well known laws of safety. Do not place iron articles against them, as they may lead the lightning in a dangerous direction. The electricity reaching the ground during a thunder-storm is greater than many suppose, as the rain-water conductors carry down considerable. A friend of ours re-

ceived a severe shock while adjusting a disarranged spout. If the roof has any considerable pitch it should be provided with fenders, to break up and hold the snow and ice, thus preventing the too often disastrous slides. Special pains should also be taken as to the steps. See that the drip from the roof or porch does not fall upon them, and, freezing, make an icy covering. The steps, if of metal or stone, should, in a northern latitude, have a wooden covering in winter. Use sand upon the sidewalks and steps during an icy time. The weight of the snow itself is often dangerous, even in the case of well constructed buildings, but it becomes more dangerous, owing to its increased weight, when saturated with water after a heavy rain-fall. In clearing the snow from the roof, see that the space where it is thrown is properly roped off and guarded.

From our own experience we are fully impressed as to danger from fire; and while we have alluded to the subject in other portions of this article, there are several matters that require detailed consideration.

The heating of the building is best done by means of steam-pipes surrounding the rooms. The pipes should be supported by iron brackets; and in no case are the pipes to come near wood-work, as fires have originated from this cause, the assertions of some ill-informed persons to the contrary notwithstanding. Where stoves are used they should stand in iron base-pieces, the edges of which are turned upward some two or three inches: this prevents sparks and loose particles of coal from falling on the floor. See that the stove-pipes are securely fastened by wires to the ceiling and chimney: that the pipe enters the brick-work flush with the flue; and if the pipe is carried through a partition, see that the thimble keeps the pipe well away from the wood-work. Keep the tops of stove and steam-pipe clear of sawdust and dirt, and pile nothing that will drip or fall against them. In burning sweepings containing sawdust, do not crowd the fire too much with the door closed, as cases are known where the flames have, with an explosion, burst from the door when opened to put in a fresh supply. One person should, in each room, be directly responsible for the care of steam-pipes or stoves, and the ventilation. The temperature that will probably be the most acceptable to the majority of persons is from 68° to 72°. The lights in each room should be under the care of one person: this prevents a general use of matches. Gas-lighting should be done with the electric hand-torch, unless all the burners are connected with a system of electric wires igniting all at once. The gas should be shut off during the day, and after the building is vacated for the night, to prevent the leakage, that is always greater or less where the piping is extensive. In case of a fire happening when the gas is lighted, shut it off as soon as the building is cleared: this will shut off some fuel from the flames. The office supply may be drawn from a separate meter, or that supply-pipe may tap the main pipe between the shut-off and the meter. Some special provision should be made for the office, as that department requires gas as times when the factory is not running. Secure gas and kerosene fixtures from swinging against the wall or under shelves. Steady all pendent fixtures by means of wires. Place protectors over all lights that come near anything overhead. The writer has attended at least one fire caused by sparks adhering to the soot upon the bottom of a glue-pot; hence the necessity of seeing that the fire is all out where the old-fashioned glue-pots are still in use. We advocate the use of steam glue-pots, not only for their safety, but for their other advantages. Oiled rags, saturated cotton waste, and all combustible waste material should be collected at the close of each day and deposited under the boilers. We know of one large furniture manufactory where several fires had occurred from the rags, saturated with filling, which was of an exceedingly combustible nature. The proprietors, for their own safety, made a change for a less dangerous composition, but at an annual loss of $2,500. In our own experience we have seen a smoking fire from rags that had been saturated with filling only ninety minutes.

Ashes and all waste combustible material not at once put under the boilers should be deposited in riveted or seamed metallic receptacles, having metallic covers, and the whole placed out-doors at a distance from the buildings. The fires resulting from smoking have been so numerous in the past, that now most well regulated factories have notices posted, prohibiting smoking upon the premises. One of the most noted manufacturing establishments in the country, in order to avoid all possibility of danger, prohibits a pipe or a cigar being brought into the factory. The old-fashioned sawdust spittoon has yielded its full quota of fires, but fortunately they have been slumbering ones, breaking out in the dead of night, or on Sundays and holidays: so the loss of life to be attributed to them is small. All spittoons should be of earthen or of metal. If an absorbent is required, use dry earth or ashes, as then, if a match, cigar-stub, or other combustible article is thrown in, no danger follows.

A special fire-proof building, at a distance from other buildings, should be devoted to the oils, turpentine, varnish, and kindred combustible stock, only a day's supply being removed at a time. When the boiler-room is left, even though temporarily, see that the openings under the boiler are closed. We had a fire in our factory, the result of a fifteen minutes absence of the fireman, who left his under door open, also the one into the fuel-room. A brisk spring breeze blew out a line of shavings that formed a pathway for the fire to a bin of very combustible material, and it was only after a stubborn fight that the building was saved. In establishments requiring the use of lenses, see that these articles are not left where they will focus. The writer once had a stereoscopic view destroyed, the instrument holding it being left in a window. Matches should be kept in iron self-closing holders, the stock to be kept in covered tin or earthen vessels. Keep the yards and surroundings free from straw, old cases, and all rubbish. One of the worst fires we ever saw was a second fire catching in some straw by a spark from the original fire, a distance away. Keep the yard well wet down in dry times. If there is a shaving-chute, see that it is tight, and does not drop any dust or shavings till the shaving-bin is reached. This chute is to have a shut-off, which is to be promptly closed upon a fire alarm being given.

A volume might easily be written upon the dangers from naphtha and benzine. Although the temptation is strong to use them, they should be banished from the factory. Where printing-presses are used, substitute turpentine for cleaning off the rolls. Some of the carburetors in the market are very dangerous, from the fact that they use the dangerous products of petroleum, which, leaking through the service-pipes, cause explosions if a fire or light is present. Keep telegraph and telephone poles away from the buildings, as the wires cause the loss of precious minutes to the firemen in raising the ladders.

The system of sprinklers introduced within the past few years affords great protection. Perhaps the best evidence we can produce in their support is the favorable opinion of the underwriters. Briefly, this system consists of pipes extending over the ceilings to the rooms, hall-ways, and stair-ways. These pipes are provided with a sprinkler about every eight feet. Each of these sprinklers is stopped by a cap held in position by fusible solder, melting for ordinary cases at 150° for engine-rooms, or dry-houses at 200°. The water pressure being constant, a wetting down is assured in case of fire. In our factory we have had two occasions to test them. Each time they went off by the heated air or smoke, the live flame not reaching to them. Their work was regarded as most satisfactory. One pattern of the hand-grenade is in our house and in the factory. While these articles, perhaps, add another means of security, too much dependence should not be placed upon them.

The public tests of all this class of extinguishers seem satisfactory, but, from age or other causes, they seem to lose their power. Five of our quart size were thrown at a neighboring fire without checking it. We then ran out our private line of hose and stopped it. The automatic electric fire alarm sounds a bell when the heat reaches a certain point: this makes it an efficient monitor in case of fire. It is of especial value for store-rooms and parts of the building not constantly occupied.

Electric light lines should be well guarded, as fires have resulted from their disarrangement. The wires, unless properly protected, are dangerous to the touch when the electric current is on. Accidents have resulted from the wires' being touched. When the fire is the result of a defective electric light apparatus, use great caution in applying the water, otherwise the person throwing it may be knocked over. Throw the water from the pail so it will leave in a mass. If it forms a continuous stream, a current is established. We can mention one fire from this cause, where two men, in trying to put it out, were repeatedly knocked over, until the cause suggested itself, when they threw the water in masses without further trouble till the current at the central supply was shut off.

The following constitute the fire apparatus outside the building: A hydrant with hose attached: the hose is coiled up and safely "housed" from the weather in a closet erected against the wall. The wrench for turning on the water is also hung up in the closet. The door is simply buttoned: then any one may use the apparatus in an emergency. Against the wall, under a protection from the weather, hang a strong ladder, with

spikes at the bottom end, a scaling-ladder having hooks at its upper end, and a fire-hook. This hook of iron, with a chain attached, is mounted upon a long, stout pole. A rope is attached to the chain. The inside portable fire apparatus, distributed at accessible points, consists of tubs and pails of water, fire-axes, ropes with hooks attached for drawing up hose, and hand fire-grenades (if they can be made to hold their vitality). Have at the foot of each flight of stairs a fire-axe, a lantern filled with sperm or lard oil, and one or more pails of water. The water in the tubs and pails, if in a freezing temperature, is to be saturated with salt. Each workman should have his appointed place for fire duty. All the hose and hydrant couplings should have couplings corresponding with those of the local fire department.

Dust may be classed under two heads,—first, that ordinarily recognized as dust, being a miscellaneous collection of fine particles, containing more or less decaying matter; and, secondly, the finely disintegrated portions of material thrown off in the mechanical process of manufacturing. The first is easily managed, so an ordinary regard for neatness renders a detailed consideration unnecessary. The steam-pipes are apt too often to be neglected, the very fine dust accumulating being thrown off and mixed with the atmosphere when the steam is suddenly let on. The rooms should be swept after the day's work is done, using moist sawdust for a sprinkling. This keeps the dust down, and the floor will soon dry. Mechanical dust is more difficult to manage. The ordinary wood sawdust is now, in the best regulated factories, conveyed by suction, produced by a fan-wheel, to a bin, or room adjacent to the boiler-room, where it is burned under the boilers, with other refuse. These ducts, while serving an admirable purpose, are also dangerous in case of fire, furnishing a direct communication to the most inflammable portions of the factory, the shut-offs being the only safety. Dust from sanding and polishing machines, which are revolving disks, drums, or reciprocating surfaces covered with sand-paper, may be also withdrawn by the air blast into a bin or receptacle by itself. Black walnut sawdust is particularly offensive to persons of catarrhal tendencies, and needs to be carefully looked after. In case of metals, the dust may be removed from in front of the workman by suction or a blast of air. Persons who have been troubled from metal dust have been enabled to continue their work by growing a moustache, which caught the particles before they could reach the nostrils. In large cities and towns, where the water-supply is drawn from a common source, the water usually is good, but in isolated factories where resource is had to wells, great caution is needed to avoid pollution from drains, manufacturing waste, etc. The ice supply is hardly at all recognized as a source of danger, yet it is important that the ice used come from a clear body of water, and, if not in motion, large enough to furnish clear blocks of ice free from dirt. Do not use ice cut from small ponds, or the inlets of large ones, as these places are usually the dumping-places of dead animals, and other objectionable refuse. The most satisfactory method of cooling water we have seen, is where

the water flows through block-tin pipes encircling the ice chamber. This gives water cold enough for ordinary purposes. Where the work is exhaustive, or the weather excessively hot, we recommend that broken ice be placed in a non-conducting receptacle. A piece of ice the size of a walnut held in the mouth will be refreshing. Before using water or ice, rinse the mouth thoroughly. Evidently many of the so-called prostrations by heat should be attributed to the immoderate use of ice-water.

In most manufacturing establishments there is a considerable amount of "handling" the goods in the process of manufacturing, transporting it from one part of the factory to another. This work is generally done by cheap and unskilled hands, and many accidents result from the lack of skill and the proper appliances for doing the work. Where the rooms are on the same level, and the pieces are large and heavy, a track should be laid, the rails of which are even with the floor. Upon this track the platform car is pushed. A differential pulley block and chain raises and lowers the articles holding them at any point. For general factory use we have found the platform trucks to give satisfaction. These trucks are made of a length to be taken upon the freight elevator. They can then be taken up-stairs, down-stairs, run over the connecting bridge between buildings, through doorways, and, in fact, in any portion of the establishment where it is desired to carry goods. This truck is a wooden platform mounted on an iron axle and wheels, with a trail-wheel at each end. It has stakes which are removable. The tops of the wheels are below the surface of the platform. Some accidents result from handling cased goods, because the workmen cannot get hold of them. It is difficult to hold a heavy case with the hook found in the hardware stores, but with a specially constructed hook our shipper claims he can hold as much as two men with the common hooks. Ours has a good point. The back curve is like the ordinary hook. The forward curve does not extend too far out, but enough to give a good leverage on the case or box. The handle or shank portion slightly recedes, and is flattened out so as to fit nicely between the fingers. The length is about double that of ordinary hooks. It is hard work for even a clumsy man to receive a "pinch" while using this hook.

Do not start the engine during the noon hour, or at other times when not expected, without giving due notice, as otherwise there is danger of somebody's being injured if he is cleaning or overhauling the machinery. There should be a complete code of signals for the engine-room, leading from every portion of the factory where machinery is used. The gong used should be of a size to be easily heard in the boiler-room, as then the stoker can shut off the engine if the engineer is temporarily absent. Many distressing accidents happen by persons being caught in the shafting and machinery. The prompt stopping of the engine is of the utmost importance. In too many shops the engineer is also the steam and gas engineer of the establishment, and is more frequently found in the shop than in the engine-room.

Avoid oiling accidents by doing this work out of work hours (when

the shafting is at rest), paying the workman detailed a special price for the constant supervision. The jars and motion communicated to the workmen by machinery and pounding are more injurious than at first supposed. The body absorbs the concussion, and produces a tired feeling upon all but the most robust.

The difference between a well and poorly conducted factory is as great as between riding in a Pullman and a caboose. Great care is needed relating to noise. Workmen on up-stairs floors should be cautioned against jumping from the benches to the floor, or dropping tools or heavy pieces of work. Sheets of thick rubber are used with good results under pounding-blocks, etc., to absorb the jar. Even in well constructed buildings the addition of a special beam or brace will often prevent the trouble from jarring machinery. In our factory the annoyance from a fussy jig-saw, running at a high rate of speed, was overcome by this method. Heavy machinery upon the first floor would best rest upon a separate foundation.

For general purposes the best seats will be found to be the ordinary four-legged, wooden-seated stool, with a home-made back added. This back is a thin piece of springy board, the top rounded off and bolted to the seat and lower round. This seat is easily mounted and dismounted. For persons standing or sitting, a foot-rest will be found of great service, for, by frequently changing from one foot to the other, the limbs are kept in a good condition. This is important to rheumatic and heavy-limbed persons. Experience has taught us, that, other things being equal, in making a journey we should select a route having cars with side foot-rests.

Saws are the leading element of danger in many factories. Probably ninety per cent. of all the accidents are the direct result of the violation of that golden rule, "Never put your hand *back* of a running saw." A piece of wood sticks a little, or a chip lodges at the back of the saw: the temptation presents itself for the workman to remove it without stopping the saw. He takes the risk, and perhaps carries a mutilated hand through life as the result. At the back of medium and large splitting saws, use a "horn." This keeps the cut open, and permits the saw to do its duty without pinching. Saws, in many kinds of work, may be covered, presenting only a slight cutting surface. Many of the circular saws are made for special work, and differ from the old-fashioned type in that a certain proportion of the teeth are hooked, instead of pointing outward. A workman would be badly mutilated on the former saw by his hand's being drawn in, while the latter would have a negative if not a repelling motion. It will be seen why these new saws demand great care upon the part of those running them. The foreman of our wood-shop says "he does not want a man to touch a saw who is afraid of it." He instructs a new hand as to the dangers, how to avoid them, and expects a cautious confidence to do the rest. During his administration of several years there has not been a serious injury in his department.

Universal moulding-machines, and others of that class, using a post or

cutter-head for holding the cutters, are most dangerous articles. The tendency is to draw in anything brought in contact. The general remarks applied to saws apply to these. There is one danger from these machines, even to the experienced hand,—that is, he may forget, when shifting the knives, to tighten them up if his attention is temporarily called away. We had one accident of this nature in our factory. It has been said there is not a person who has run one of these machines any length of time who has escaped without mutilation or cuts. We cannot contradict the assertion from our own knowledge.

In showing visitors over a manufacturing establishment, request them to lay aside their cigars, and impress upon them the importance of considering each piece of machinery as in motion. A nicely running saw or cutter-head, to many, conveys the idea of an object at rest.

Grindstones, if running at a high speed, should be covered. They, as well as emery wheels, should be placed in a room by themselves, or in a corner, out of the way of the other workmen. Many bad accidents have been the result of broken wheels. Fewer belt accidents would occur were loose pulleys more generally used, instead of leaving a belt to hang on the shaft when not in use, and putting on while running.

Some workmen have a practice of laying down their tools with the cutting end projecting over the edge of the bench. This is done to save the cutting surface. A better plan is to lay the tool point away from the workman, and resting on pieces of wood on the bench. We recall a case of a marketman, who, leaving his knife pointing outward, jumped forward in the act of hanging up some mutton, and received a fatal wound.

The liquor question, in a general way, it may not be proper for us to consider, but in its bearings upon factory life it is important. No workman should be permitted to work while under the influence of liquor, nor to run a piece of machinery till he has fully recovered from the effects of a spree. The chronic disordered condition of some workmen, after vacations and holidays, has caused many liberal-minded employers to contract the days off to the smallest possible number.

Accidents arise from amateur railroading, as in many cases the workmen act as switchmen or brakemen where side tracks enter the factory grounds. If possible, the side track should be in a straight line, as then a fair view may be had. Cars should not be moved at all without timely instruction and notice. It is quite common, where there are several cars, to leave one or more spaces for a passage-way through. Fatal accidents have resulted from pushing the cars together without notice. Reckless engineers delight in giving the cars a good "kick" in switching, when they know a green hand is at the brake. This trick was played upon a friend of ours upon his own premises. Had one of his men been at the brake, a fatal accident would have been the result. Even with his experience and strength, the car reached the dead end with a force that threw him from the car, leaving him hanging from the brake by his powerful arms.

Machinery kept constantly running, and under inspection, is less liable to break down and cause accidents than where it remains idle a good portion of the time.

Where the workmen are of good habits, it is better in depressed times to give vacations in turn rather than close entirely, or to give full work to only a few.

We believe in placing a seriously injured person as soon as possible under the care of a competent surgeon. In most places a few minutes must elapse before such skill is obtainable: hence the importance of such intelligent action as will present the patient to the doctor in the best condition. Concise elementary directions in case of accidents, published under medical supervision, are now obtainable in the large cities. These are printed upon card-board, and at least one of these notices should be posted in every factory. To supplement and carry out the medical directions recommended, an emergency box should be kept safely in some known place, and under the charge of some cool-headed, intelligent person. The emergency box should contain a few bottles of medicine, such as brandy, arnica, etc., prepared by an apothecary, each bottle properly labelled. The selection of the medicine should be left to a doctor or to an apothecary, who has knowledge of the dangers of the factory. Besides the above, each case should contain a Martin's rubber bandage, and a piece of rubber tube for tying; some small, strong rubber bands. These articles are for use in case of bleeding. A box of surgeon's plaster, cloth bandages, sponge, graduated glass (tea and table-spoonfuls), a medicine holder with spout, and a folding fan.

From a lay point of view we think the medical gentlemen have, in their instructions, given all that is required where assistance is within easy call, excepting the manner of handling. This subject has not received the attention it should, as "kind hands" are often very ignorant and clumsy. We believe a series of illustrations, showing the proper manner of lifting and supporting sick or wounded persons, would be of great benefit, not only to the factory, but also for the home.

A factory located in a good-sized city has the advantages of hospital ambulance and police patrol service. Where such wagons are in use, we recommend that each factory should own a stretcher fitting the vehicles. By this means a disabled person may at once be laid upon a stretcher ready for the hospital attendants upon their arrival. For other purposes, use a stretcher constructed in accordance with the views of the local doctor, not, however, losing sight of the removable handles, by which means in severe cases the handles may be removed, leaving the canvas upon the bed and under the patient.

To obtain the *best* medical attendance is often a serious matter for the disabled mechanic, owing to his lack of funds. The public hospitals in the large cities are all that could be expected, but they cannot cover the whole, and take care of every one needing medical assistance. Every establishment employing one hundred hands or over should organize a mutual relief association, for the purpose of paying medical fees and

nursing. The money could be used for paying for a free bed in some hospital. Where this convenience does not exist, an upper room in some comfortable building should be secured for the dangerously sick or wounded. We think in an establishment of ordinary risk a regular contribution of ten cents a week will be sufficient to pay all ordinary demands; any excess to be assessed, but not to exceed twenty five cents in any one week. Many workmen regard going to a hospital as but one remove from entering a jail. This ignorant idea should be dispelled, and would be by an acquaintance with any good hospital where trained nurses are employed. This idea, we feel, is quite common; and more popular information is required, so that a man will believe he enters a hospital to be *cured*, and not to die.

A shop danger (but thanks to local health officers a lessening one) is that from contagious diseases. Most American-born workmen recognize and respect the benefit of restriction in such cases. Many of foreign birth disregard these limitations, and recklessly endanger their fellow-workmen. As the latter are almost invariably the ignorant and most superstitious, relying upon charms rather than upon medical skill to effect a cure, the remedy suggested would seem to be,—restraining power first, then popular instruction. We consider the subject of personal cleanliness of more importance than the general shop condition. We know of a painter who attributes a large portion of the sickness of his trade to their handling their food and face with soiled hands,—his rule being to keep his hands away from his mouth unless they are perfectly clean. The hair and whiskers require to be kept clean. Few persons are aware how readily they absorb and hold impurities and particles from the atmosphere. In cleaning up, a few drops of ammonia in warm water will be found an excellent wash for the hair and whiskers, as it is, indeed, for the rest of the body. Hot water cannot always be conveniently carried over a building. In our factory we overcame the difficulty in this way: Our washing-up sinks are the ordinary long iron ones. At one end is placed a copper vessel holding several gallons. A cold-water pipe leads to this vessel, and a steam pipe enters it. By turning the steam valve the water may be blown up and heated as hot as desired. The hot water from this tank is dipped into the basin, and tempered from the independent cold water faucet to suit.

Workmen who bring their dinners should be furnished with facilities for heating or making tea or coffee. The refuse of all fruits, peach-stones and banana skins in particular, should be thrown into some proper receptacle. The floor is a most dangerous place when sprinkled with these articles.

Persons at work over poisonous substances should talk but little while at work: by so doing they breathe more through the nose. We have in mind a great talker,—a painter,—whose system seemed to be charged with the white lead paint which he applied to small articles upon the bench before him. His room-mates, of a less gossiping nature, escaped seemingly uninjured. The above occurred in a better lighted and ventilated paint room than is ordinarily seen. The physician summoned to this painter quickly diagnosed the trouble as lead poisoning, and stated the cause as readily as though he had been a shop-mate.

Most factories abreast of the times, whether engaged in metal, wood, or textile manufacturing, have special processes in which the use of poisonous chemicals is required. These should be kept in glass or earthen receptacles, properly labelled with the word "Poison," the antidote also being added. The best chemists now furnish their preparations thus labelled.

Economy of space in some buildings requires that the overhead (ceiling) spaces be used. Where this is done, keep the articles hung up away from over the work-benches as much as possible. Use hooks or pins, the outer ends of which are the highest. This prevents jars sending down the articles hung up. Pack goods on overhanging shelves so they cannot be shaken down. Keep tools, flower-pots, etc., off the window-sills, unless there is a guard to the window. One of our most respected state governors, now in office, once had a narrow escape from a flower-pot that fell from an upper window.

Observation has convinced us that the ordinary set rules, no matter how well framed, are distasteful to the average person, and fall short of the mark. Our attention was recently called to a set of rules for the guidance of a large bindery and printing establishment. It would hardly be possible for any one to comply with all of the requirements. One rule, however, so covered the whole that we repeat it from memory: "An honest day's work will be required for a full day's pay." Any person who is not willing to comply with this should be discharged. Each foreman should be held accountable for those in his immediate department, and he should have authority to discharge for cause. He should be consulted in taking on new hands.

The introduction of special machinery in almost every manufacturing department, has, in our opinion, a tendency to dwarf the man mentally, less skilled hand-work being required than under the old system. What we now consider as a trade was once only a part of a trade. This dwarfing of the mental faculties requires a counteracting influence, which must, we believe, come mainly through reading. We advocate anything that will enlarge and improve the mental condition. In view of the above, we recommend that each establishment have only the common rules posted, such as relate to smoking, elevators, etc., and that all details be printed in book form and given to each person employed. This book is to convey, in the way of *suggestions*, what is expected. The ideal must not be above the reach of any person in the factory. The truth should be advanced, that the interests of employer and employés are identical. Each person should feel that he is responsible for not only his own welfare, but also for that of his shop-mates. We believe such a presentation of the case will arouse in each workman an idea of his responsibilities, and a purpose to incorporate the suggestions in his daily shop-life.

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